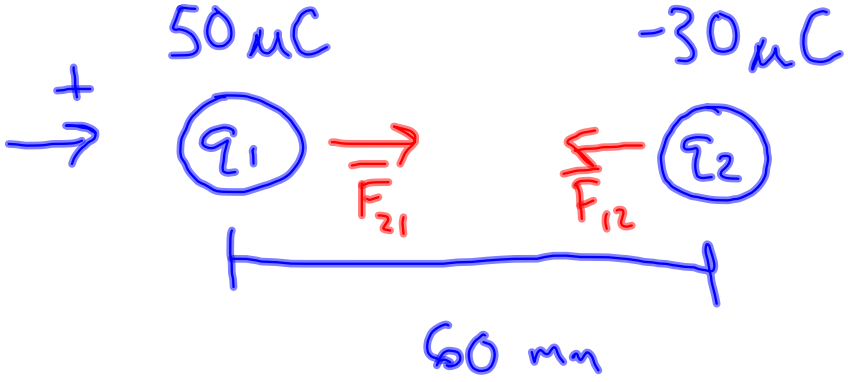
HW: p. 566: 1, 3

p. 568: 2

Two charged particles are brought near to each other. Charge 1 has a value of 50 microC (50E-6 C), charge 2 has a value of -30 microC (30E-6), and they are separated by 60 mm. What is the force that each exerts on the other?

$\mu = \text{micro} = 10^{-6}$



direction

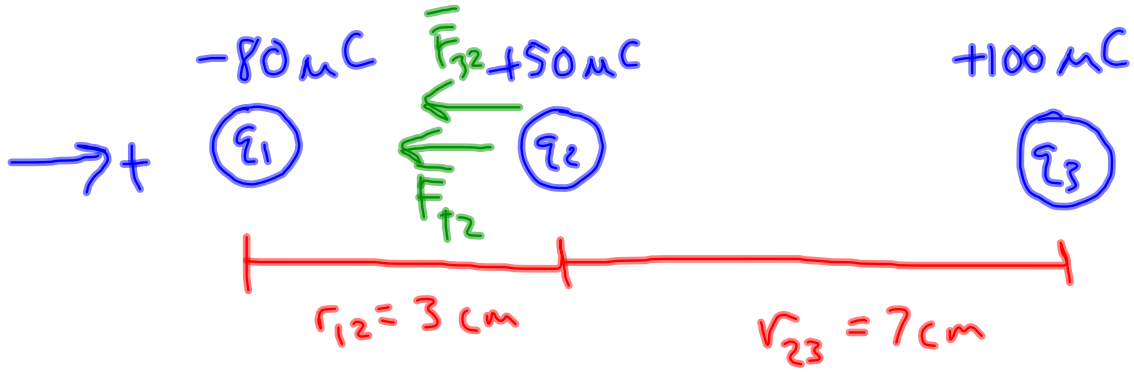
magnitude

$$\vec{F}_{21} = + \frac{k|q_1||q_2|}{r^2}$$

$$= + \frac{(8.99E9\ N\cdot m^2/C^2)(50E\text{-}6\ C)(30E\text{-}6\ C)}{(60E\text{-}3\ m)^2}$$

$$= +3745\ N$$

Three charges are arranged in a line. Charge 1 is at the origin and has a value of -80 microC, charge 2 is at +3 cm and has a value of +50 microC, and charge 3 is at +10 cm and has a value of +100 microC. What is the net force (magnitude and direction) that acts on charge 2?



$$\Sigma \bar{F} = \bar{F}_{12} + \bar{F}_{32}$$

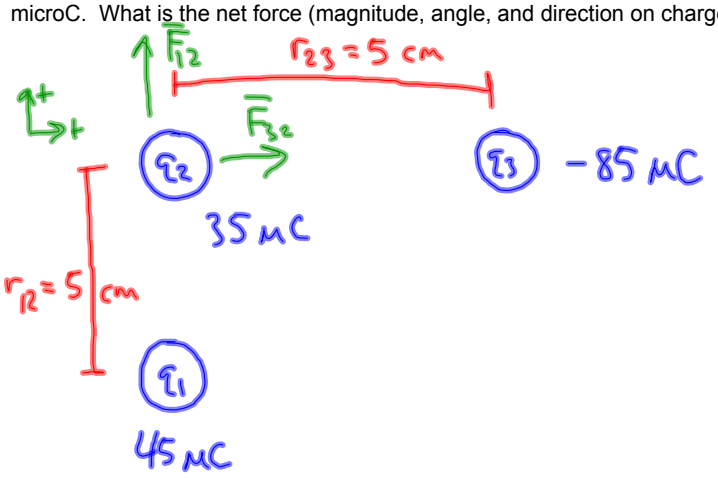
$$= -\frac{k|q_1||q_2|}{r_{12}^2} + \frac{-k|q_2||q_3|}{r_{23}^2}$$

$$= -\frac{(8.99E9\ N\cdot m^2/C^2)(80E\text{-}6\ C)(50E\text{-}6\ C)}{(3E\text{-}2\ m)^2}$$

$$-\frac{(8.99E9\ N\cdot m^2/C^2)(50E\text{-}6\ C)(100E\text{-}6\ C)}{(7E\text{-}2\ m)^2}$$

$$= -49200\ N$$

Three charges are arranged in a right triangle (see picture below). Charge 1 has a value of 45 microC, charge 2 has a value of 35 microC, and charge 3 has a value of -85 microC. What is the net force (magnitude, angle, and direction on charge 2?



$$\Sigma \vec{F}_x = \vec{F}_{12x} + \vec{F}_{32x}$$

$$= \frac{k|q_3||q_2|}{r_{23}^2}$$

$$= \frac{(8.99E9\ N\cdot m^2/C^2)(85E\text{-}6\ C)(35E\text{-}6\ C)}{(.05\ m)^2}$$

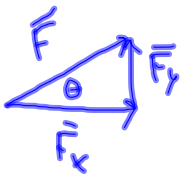
$$= 10698\ N$$

$$\Sigma \vec{F}_y = \vec{F}_{12y} + \vec{F}_{32y}$$

$$= \frac{k|q_1||q_2|}{r_R^2}$$

$$= \frac{(8.99E9\ N\cdot m^2/C^2)(45E\text{-}6\ C)(35E\text{-}6\ C)}{(.05\ m)^2}$$

$$= 5664\ N$$



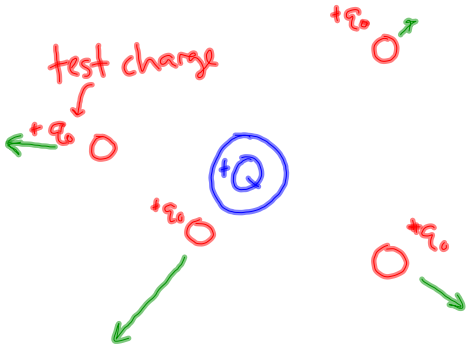
$F = 12105\ N$

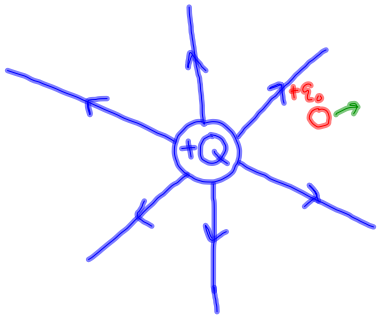
$\theta = 27.9°$

N of E

Electric Fields:

- Around every charged object there exists an electric field.





- to calculate electric field;

$$E = \frac{F}{q_0}$$ → electric force

↳ test charge

↳ electric field

$F = \frac{kq_0q_2}{r^2}$

$$E = \frac{\frac{kq_0Q}{r^2}}{q_0} = \frac{kQ}{r^2}$$

- if just want to calculate electric field at a point,

$$E = \frac{kq}{r^2}$$ for magnitude

direction comes from +/- of charge and charge arrangement

Electric field lines:

- lines never overlap
- for + charges, arrows point outwards

  for − charges, arrows point inwards
- we can draw an infinite number,

  but minimum = 3.